

EXHIBIT A

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Standability Expression (Lodging Resistance): an evaluation method to determine the percentage of erect stems ($> 45^\circ$).

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PLANT CULTURE

Greenhouse

Container Bench, flat, or pot deep enough to allow root development
Media Sand, soil or potting mix
Temp/light 24 to 30°C; 16+ hr day length
No. of Plants 20 to 25 per replication
No. of Reps..... 3 to 6 replications
Other Fertilize and control pests as necessary

FIELD ESTABLISHMENT

Location Transplant 8-12 week old plants to the field during mid to late May; direct seeding in rows or variety trial plots is acceptable
Spacing 0.3 to 0.4m x 0.6 to 1.0m transplanted; seeded rows or plots at standard seeding rate
Culture Maintain vigorous growth, control weeds and insects
Test Length Scoring can occur in year of establishment after 2 clip backs, scoring the year after establishment to allow crown development is preferred.
Test Location No limitations, however, adverse environmental conditions such as heavy thunderstorms and/or strong winds may increase degree of lodging severity. Moderate to severe drought conditions may decrease lodging expression.

CLIPPING MANAGEMENT

Nurseries should be managed to allow plants to reach early to mid bloom stage during each regrowth cycle. Susceptible plants generally lodge by late bud to early bloom in the spring and early to mid bloom during the summer.

RATING

Rating can be taken once the susceptible check is uniformly lodged, generally during flowering. A 0 to 9 scale is used to rate standability (lodging resistance). This scale can be used to estimate percentage of erect stems ($>45^\circ$) on individual spaced transplanted plants or seeded rows/plots. In practice, alfalfa is grown in solid seeded stands and is not spaced transplanted. Seeded rows/plots are preferred compared to spaced transplanted plants because neighboring plants within a canopy help support each other. Spaced transplanted plants score slightly lower for standability compared to seeded rows or plots. A single rating often provides accurate description of varietal differences. Multiple ratings will enhance classification.

9 Resistant 91 to 100% erect stems
7 Resistant 71 to 90% erect stems
5 Moderately Resistant 51 to 70 % erect stems
3 Moderately Resistant 31 to 50% erect stems
1 Susceptible 11 to 30% erect stems
0 Susceptible 0 to 10% erect stems

Alfalfa populations can be characterized for standability (lodging resistance) by calculating an average standability index (SI) and percentage of lodging resistant plants (combined percentage of plants rated as class 7 and 9)

CHECK CULTIVARS

	Approximate Expected Resistance (%)	Acceptable Range of Resistance (%)	Standability Rating	Typical SI
Resistant				
54H11 ¹	68	55-80	8	6.9
CW 14032 ²	75	60-85	8	7.0
Europe ³	60	45-75	7	6.5
Moderate Resistant				
CW 75046 ²	40	25-50	5	5.8
Mercedes ³	40	25-50	5	5.7
Susceptible				
5454	0	0-10	0	0.8
WL 319HQ	0	0-5	0	0.4

¹ 54H11 contains proprietary germplasm. As such, seed will only be made available to evaluators from Pioneer. Prior to seed shipment, requestors must agree to use the seed exclusively for the testing purposes defined above; the Pioneer materials transfer/use agreement is available from Pioneer (address below); no other agreement is required.

² CW 14032 and CW 75046 contain proprietary germplasm. As such, seed will only be made available to evaluators from Cal West Seeds. Prior to seed shipment, requestors must agree to use the seed exclusively for the testing purposes defined above; the Cal West Seeds materials transfer/use agreement is available from Cal West Seeds (address below); no other agreement is required.

³ Only include the varieties Europe and/or Mercedes as comparison to European standards for lodging resistance. In France, the variety Europe is considered resistant to lodging and the variety Mercedes is considered moderately resistant to lodging. Europe and Mercedes are not adapted to North American field environments and may not persist for duration of test.

SCIENTISTS WITH EXPERTISE

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HELPFUL INFORMATION

A successful test must show a significant difference ($p=0.95$) between the resistant class check cultivar and the susceptible class check cultivar. The resistant class check must have an SI of 6.0 or higher. The susceptible class check must have an SI of 1.0 or lower. Readings taken too early may overestimate lodging resistance.

Irrigation and/or high soil nitrogen levels may increase degree of lodging severity. Standability expression (lodging resistance) is not known to vary by synthetic generation of seed. Seed yield is genetically correlated with lodging resistance (Bolaños-Aguilar, et al., 2002).

REFERENCES

1. Bolaños-Aguilar, E.D., C. Huyghe, C. Ecalie, J. Hacquet, and B. Julier. 2002. Effect of Cultivar and Environment on Seed Yield in Alfalfa. *Crop Sci.* 42:45-50.

EXHIBIT B

C290

1. C290 is a 115-plant synthetic variety resulting from phenotypic recurrent selection for resistance to silverleaf whitefly (*Bemisia argentifolii*) in a field nursery near Westmorland, CA. Source material traces to two very non-dormant lines selected for resistance to spotted alfalfa aphid. Parental germplasm traces to Hasawi, WL 605, and Pioneer 5929. Approximate germplasm source contributions are: Chilean -5%; Peruvian 5%; Indian - 10%; African -30%; and Arabian -50%.
2. C290 is adapted to and intended for use in the Southwestern United States. C290 has been yield tested in California.
3. Flower color of C290 at Syn 2 approximates 100% purple with a trace of cream and variegated. The fall dormancy of C290 is significantly greater than that of CUF 101.
4. C290 has high resistance to Fusarium wilt, pea aphid blue alfalfa aphid northern root-knot nematode and southern root-knot nematode; and resistance to Phytophthora root rot, stem nematode and spotted alfalfa aphid. Reaction to anthracnose (Race 1), bacterial wilt, Verticillium wilt, and Aphanomyces root rot (Race 1) has not been adequately tested.
5. Breeder was produced in 1995 on 115 plants under cage isolation at Bakersfield, CA. Sufficient foundation seed for the expected life of the variety will be maintained by W-L Research. One generation of Breeder (Syn 1) and two generations each of Foundation (Syn 2 or 3) and Certified (Syn 3 or 4) seed are recognized. The maximum permitted length of stand for Foundation and Certified seed fields are 3 and 5 years respectively. Production of Syn 3 Foundation seed requires consent of the breeder.
6. Certified seed will be marketed in 1998.
7. It is undecided whether application will be made for Plant Variety Protection.
8. The information in this application can be turned over to the PVP office.
9. Experimental Designation: C290. Date submitted: November 1997

EXHIBIT C

WL 711 WF

1. WL 711 WF is a 115-plant synthetic variety resulting from phenotypic recurrent selection for resistance to silverleaf whitefly (*Bemisia argentifolii*) in a field nursery near Westmorland, CA. Source material traces to two very non-dormant lines selected for resistance to spotted alfalfa aphid. Parental germplasm traces to Hasawi, WL 605 and Pioneer 5929. Approximate germplasm source contributions are Chilean – 5%; Peruvian – 5%; Indian – 10%; African – 30%; and Arabian – 50%.
2. WL 711 WF is adapted to and intended for use in the Southwestern United States. WL 711 WF has been yield tested in California.
3. Flower color of WL 711 WF at Syn 2 approximates 100% purple with a trace of cream and variegated. The fall dormancy of WL 711 WF is similar to the Class 10 varieties.
4. WL 711 WF has high resistance to Fusarium wilt, pea aphid, blue alfalfa aphid, northern root-knot nematode and southern root-knot nematode; and resistance to Phytophthora root rot, stem nematode and spotted alfalfa aphid. Reaction to anthracnose (Race 1), bacterial wilt, Verticillium wilt and Aphanomyces root rot (Race 1) has not been adequately tested.
5. Breeder seed was produced in 1991 on 115 plants under cage isolation at Bakersfield, California. Sufficient foundation seed for the expected life of the variety will be maintained by W-L Research. One generation of Breeder (Syn 1) and two generations each of Foundation (Syn 2 or 3) and Certified (Syn 3 or 4) seed are recognized. The maximum permitted length of stand for Foundation and Certified seed fields are three and five years, respectively. Production of Syn 3 Foundation seed requires consent of the breeder.
6. Certified seed will be marketed in 1998.
7. It is undecided whether application will be made for Plant Variety Protection.
8. The information in this application is available to the PVP office.
9. Variety Name: WL 711 WF Date Submitted: November 1997

Experimental Designation: C290

Date NAVRB first accepted this variety: January, 1998

Date this amendment submitted: November, 1998